

1971 OPERATING
SUMMARY



LIBRARY
MINISTRY OF THE ENVIRONMENT

STRATFORD

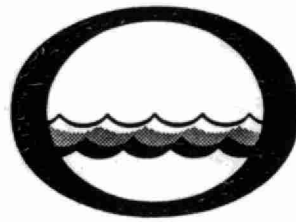
WATER POLLUTION CONTROL PLANT

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

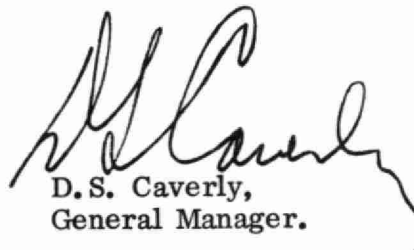


Water management in Ontario

Ontario
Water Resources
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.


D.S. Caverly,
General Manager.


D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN
R. D. Johnston

VICE-CHAIRMAN
J. H. H. Root, M. P. P.

COMMISSIONERS
H. E. Brown
F. S. Hollingsworth
Dr. C. A. Martin
D. A. Moodie
L. E. Venchiarutti

GENERAL MANAGER
D. S. Caverly

ASSISTANT GENERAL MANAGERS
R. K. L. Sachse
K. H. Sharpe
F. A. Voegelé
A. K. Watt

COMMISSION SECRETARY
W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

Director
D. A. McTavish

Assistant Director
C. W. Perry

Regional Supervisor
P. J. Osmond

Operations Engineer
R. E. Brown

135 St. Clair Avenue West
Toronto 195

STRATFORD
WATER POLLUTION CONTROL PLANT

operated for

THE CITY OF STRATFORD

by the

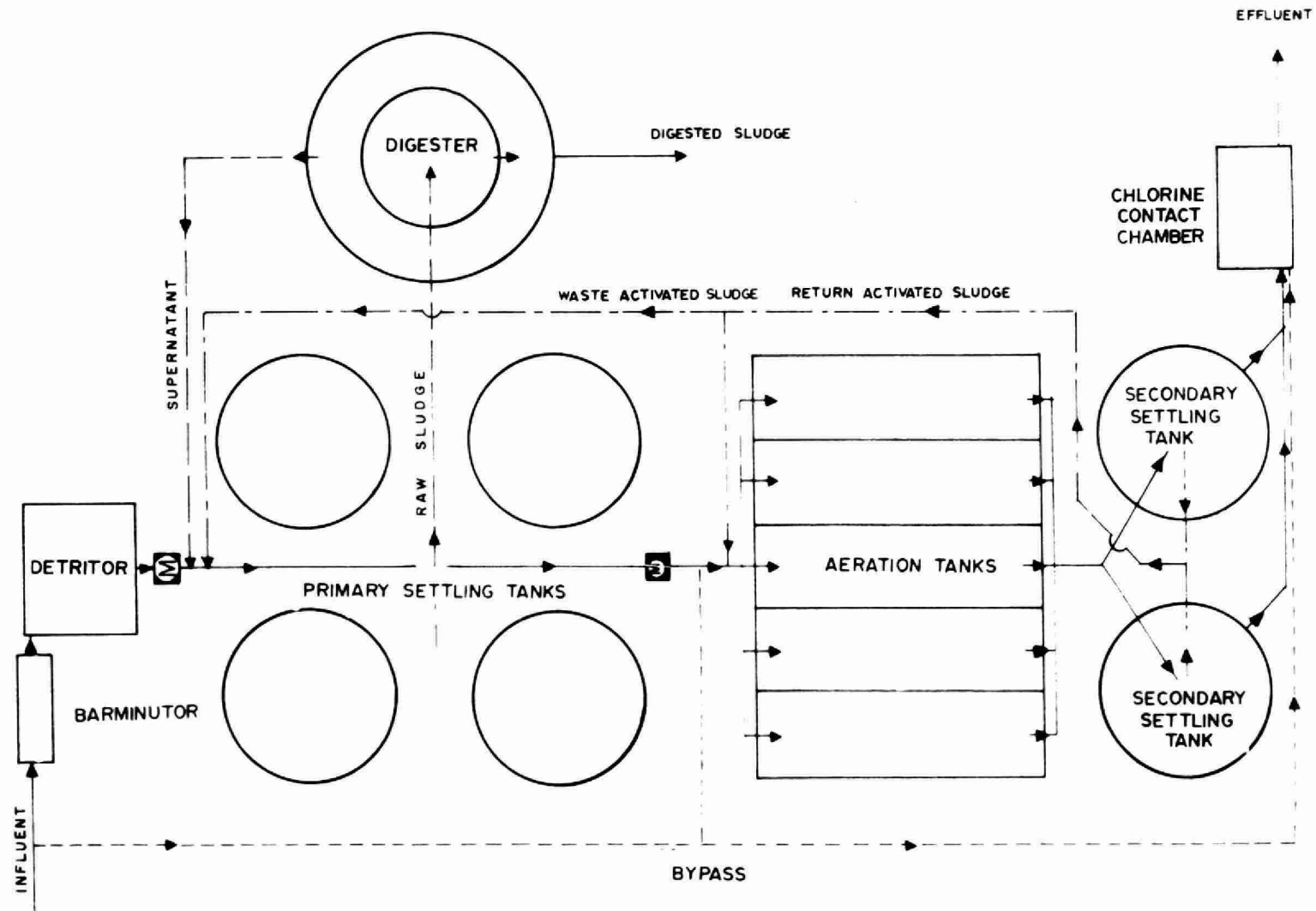
ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY

CONTENTS

Title Page		1
Flow Diagram		4
Design Data		5
'71 Review		6
Project Costs		9
Process Data		12

STRATFORD WATER POLLUTION CONTROL PLANT



DESIGN DATA

PROJECT NO. 2-0002-57

TREATMENT Activated Sludge

DESIGN FLOW 6.0 mgd

DESIGN POPULATION 30,000

BOD - Raw Sewage 140 mg/l
- Removal 90%

SS - Raw Sewage 250 mg/l
- Removal 95%

PRIMARY TREATMENT

Comminution

Type: Barminutor
Size: One Model C (36")

Grit Removal

Type: Dorr detritor
Size: One 20' x 20' x 1' (2500 gal)
Retention: 0.9 min

Primary Sedimentation

Type: Infilco
Size: Four 80' dia x 10½' swd (1.32 mil gal)
NOTE: Two used for storm flows only
Retention: 2.7 hr (2 cl)
Loading: Surface, 600 gal/ft²/day
Weir, 12,000 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; triple-pass
Size: Five 85½' x 25' 8" (avg) x 13' (0.97 mil gal)
Retention: 3.9 hr

Diffusers

Type: Activated Sludge Ltd.
Alundum Domes

Air Supply

Type: Roots-Connersville
Size: Three 1750 cfm

Secondary Sedimentation

Type: Infilco
Size: Two 80' dia x 11' 3" swd (0.705 mil gal)
Retention: 2.7 hr
Loading: Surface, 600 gal/ft²/day
Weir, 12,000 gal/ft/day

CHLORINATION

Chlorine Contact Chamber

Size: 67' x 27' x 8' (90,000 gal)
Retention: 22 min

Chlorinator

One F & P 500 lb/day

OUTFALL

Avon River

SLUDGE HANDLING

Digestion System - Heated, two-stage

Type: Gas mixed
Size: One 73' dia x 26' swd (100,00 cu ft or 0.624 mil gal)

Primary Stage (inner)

Size: 67,600 cu ft
Loading: 2.8 lb/cu ft/mo

Secondary Stage (outer ring)

Size: 32,400 cu ft
Total Loading: 1.9 lb/cu ft/mo

'71 Review

GENERAL

The project consists of a 6 mgd diffused air activated sludge sewage treatment plant including comminution, grit removal, chlorination, double stage digestion and liquid sludge haulage.

The WPCP is operated by a staff of four operators, one maintenance operator plus a superintendent. Staff coverage is provided 12 hours per day, seven days per week with each man working an average of 40 hours per week. The staff maintained a very clean, attractive and efficiently operated plant. No major electrical or mechanical problems were experienced during the year.

EXPENDITURES

In 1971 the plant treated a total of 1185 million gallons of sewage at a total cost of \$86,608.83. The operating cost per million gallons was \$73.01 and the cost per pound of BOD removed was nine cents.

PLANT FLOWS and CHLORINATION

The total gallonage treated in 1971 was 1185 million. The plant operated at 54 percent of hydraulic capacity over the year, at 91.5 percent during the peak month and 223 percent during the peak day. From the flow probability graph it can be seen that the design capacity of the plant was exceeded 6 percent of the time.

The final effluent was chlorinated for the full year. A total of 23,800 pounds of chlorine was used at an average dosage of 2.0 mg/l. The chlorine residual was 0.5 mg/l in the final effluent prior to discharge to the Avon River.

PLANT LOADING and EFFICIENCY

The average raw sewage strengths in 1971 were 97 mg/l BOD and 168 mg/l suspended solids. The average strengths in the final effluent of 9 mg/l BOD and 9 mg/l suspended solids, represented removal efficiencies of 91 and 95 percent respectively. The final effluent met the OWRC objectives of 15 ppm each approximately 82 percent of the time for BOD and 89 percent of the time for suspended solids.

Approximately 0.954 million pounds of BOD and 1.749 million pounds of suspended solids were removed during the year. The primary effluent had an average strength of 32 mg/l and 42 mg/l suspended solids, representing percent removals of 67 and 75 in the primary section of the plant.

The average pounds of BOD escaping to the river was 292, which is just slightly below the special objective of 300 pounds per day imposed for this receiving stream.

A total of 14 cubic yards of grit was removed. This represents a removal quantity of 0.3 cubic feet per million gallons which is normal for this type of facility.

SLUDGE DIGESTION and DISPOSAL

A total of 2.57 million gallons of raw sludge at a concentration of 6.0 percent total solids were pumped to the digester. A total of 2.42 million gallons of digested sludge at an average concentration of 4.1 percent total solids was trucked away for disposal. This amounted to 90 percent of the raw sludge pumped to the digester or 13.0 cubic yards per million gallons of raw sewage. Reduction in sludge volumes by supernating has never been successful at this plant.

AERATION

The average BOD entering the aeration section was 32 mg/l and the average loading was 0.05 pounds of BOD per pound of MLSS. An average of 5300 cubic feet of air was supplied per pound of BOD removed.

CONCLUSIONS

Throughout 1971 the plant staff operated a very attractive plant producing an effluent of excellent quality.

Since tertiary treatment is required because of the low assimilation capability of the Avon River, a consultant was instructed to proceed with the final design of the plant expansion.

PROJECT COSTS

NET CAPITAL COST (Final)	\$925,309.42
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>309.42</u>
Long Term Debt to OWRC	<u>\$925,000.00</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	<u>\$345,669.58</u>
Net Operating	\$ 86,608.83
Debt Retirement	5,695.00
Reserve	-
Interest Charged	<u>51,884.02</u>
TOTAL	<u>\$144,187.85</u>

RESERVE ACCOUNT

Balance @ January 1, 1971	\$ 89,995.81
Deposited by Municipality	-
Interest Earned	<u>5,940.84</u>
	\$ 95,936.65
Less Expenditures	<u>-</u>
Balance @ December 31, 1971	<u>\$ 95,936.65</u>

OPERATING COSTS

1971 COSTS

PAYROLL	6 2 %
FUEL	< 1 %
POWER	5 %
CHEMICALS	3 %
GENERAL SUPPLIES	5 %
EQUIPMENT	2 %
REPAIRS & MAINTENANCE	3 %
SUNDRY	1 8 %
WATER	1 %
TRAVEL	1 %

TOTAL ANNUAL COST

NET OPERATING	6 0 %
DEBT RETIREMENT	4 %
RESERVE	N I L %
INTEREST	3 6 %

YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	¢ per lb BOD
1967	1586.6	\$65,593.65	\$42.37	2 cents
1968	1232.1	69,371.20	56.30	2 cents
1969	1322.5	75,996.47	57.46	6 cents
1970	1178.1	80,122.67	68.01	4 cents
1971	1185.	86,608.83	73.01	9 cents

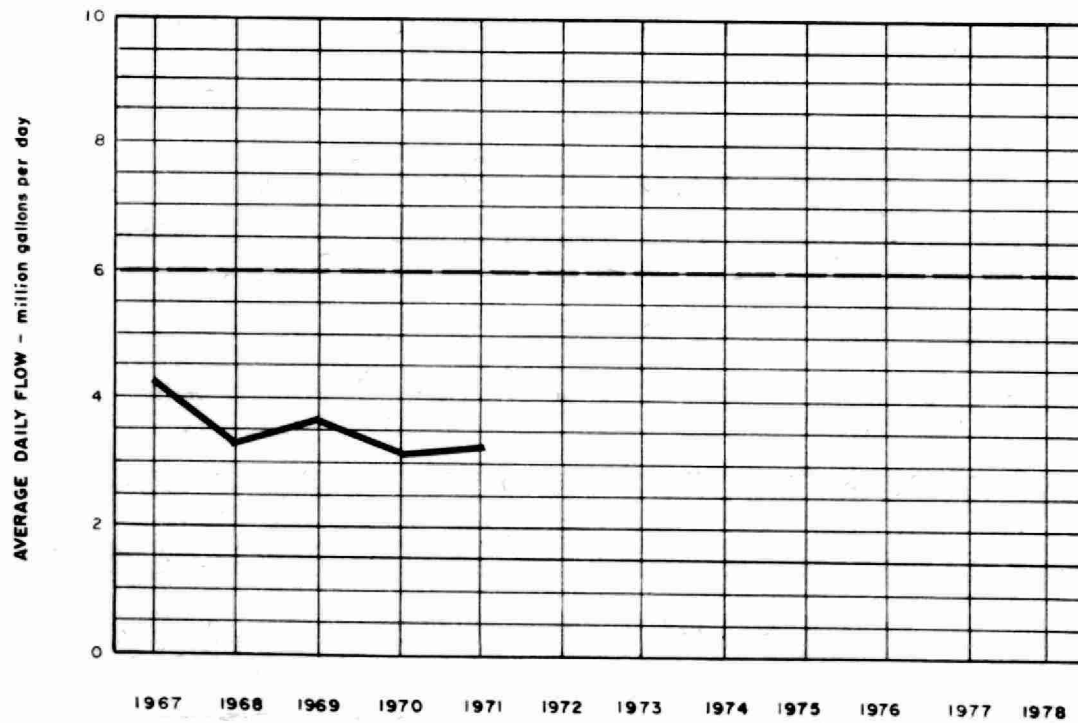
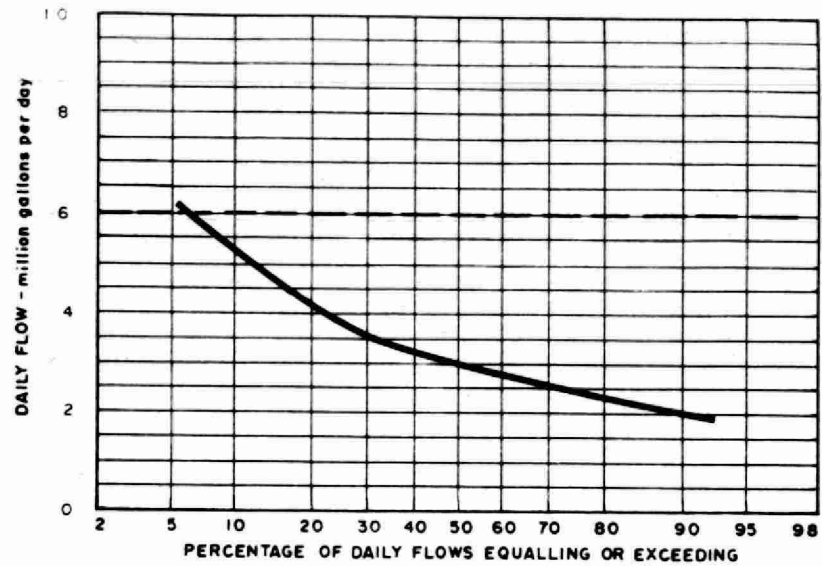
MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	4007.40	3628.53	-	-	-	-	115.32	-	263.55	-	-	-
FEB	9774.08	5388.72	-	-	482.15	2440.20	587.68	-	78.04	719.88	53.41	24.00
MAR	5560.70	3640.83	-	-	445.35	-	376.29	-	754.07	281.00	53.41	9.75
APR	6519.86	3640.74	-	-	352.15	25.21	229.32	-	110.85	2082.11	53.68	25.80
MAY	6268.05	3643.72	381.14	-	402.55	-	143.01	-	291.82	1342.23	53.68	9.90
JUNE	6442.83	4033.50	87.73	-	360.95	(4.86)	480.95	-	114.16	1246.79	54.72	68.89
JULY	6985.08	3647.72	455.90	-	372.55	-	584.43	140.08	62.75	1644.37	66.48	10.90
AUG	5256.39	3653.01	469.07	-	363.75	-	313.60	380.85	11.31	-	55.20	9.60
SEPT	9642.89	3598.41	174.18	-	280.95	96.32	184.15	-	167.70	4087.50	53.68	-
OCT	7549.00	6118.12	113.21	-	322.38	-	229.88	-	491.43	-	53.68	220.30
NOV	8099.34	5246.92	324.50	138.48	-	(116.20)	231.05	-	-	1511.48	345.26	417.85
DEC	11503.21	5395.78	278.88	74.87	730.96	-	554.82	1014.09	227.09	3014.01	107.36	105.35
TOTAL	86608.83	51636.00	2284.61	213.35	4113.74	2440.67	4030.50	1535.02	2572.77	15929.37	950.56	902.24

Brackets indicate credit.

* Sundry includes sludge haulage costs of \$14,267.36

PROCESS DATA FLOWS

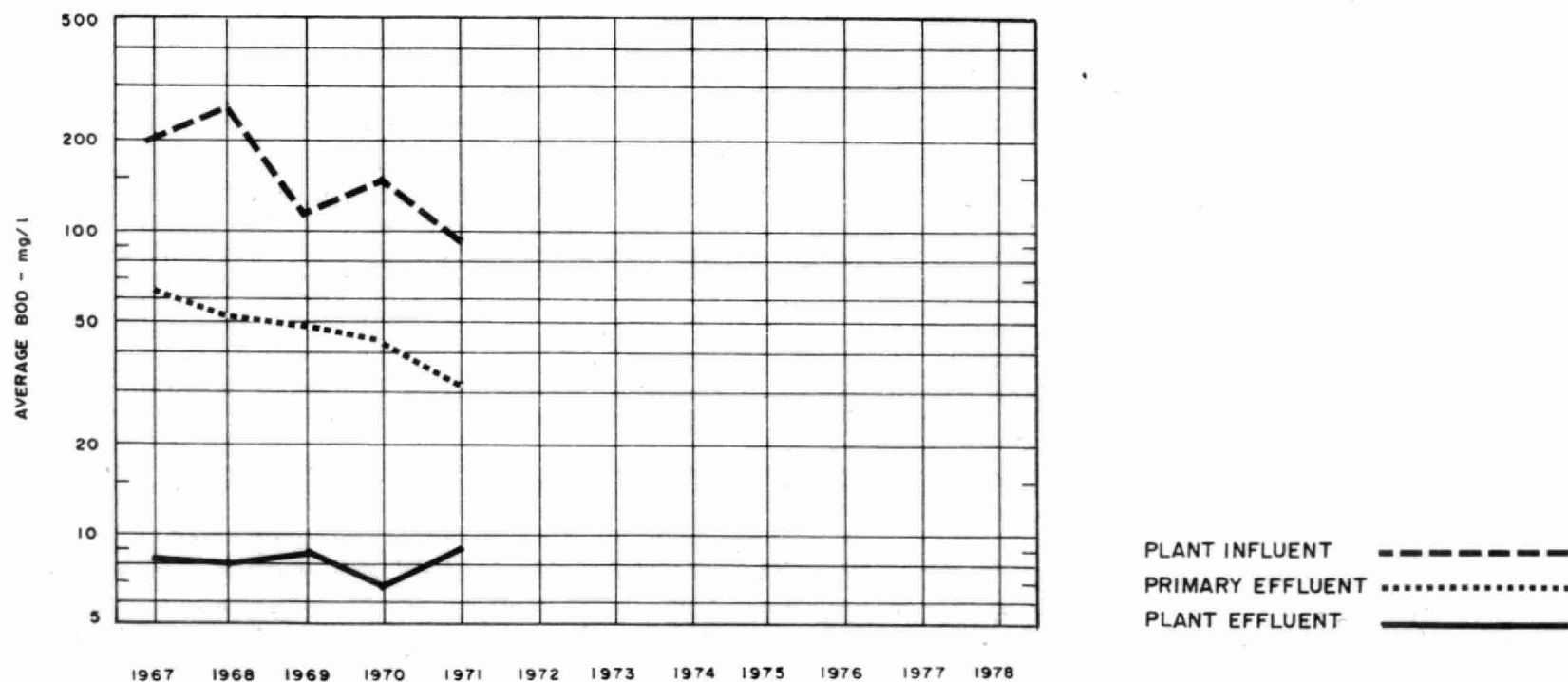
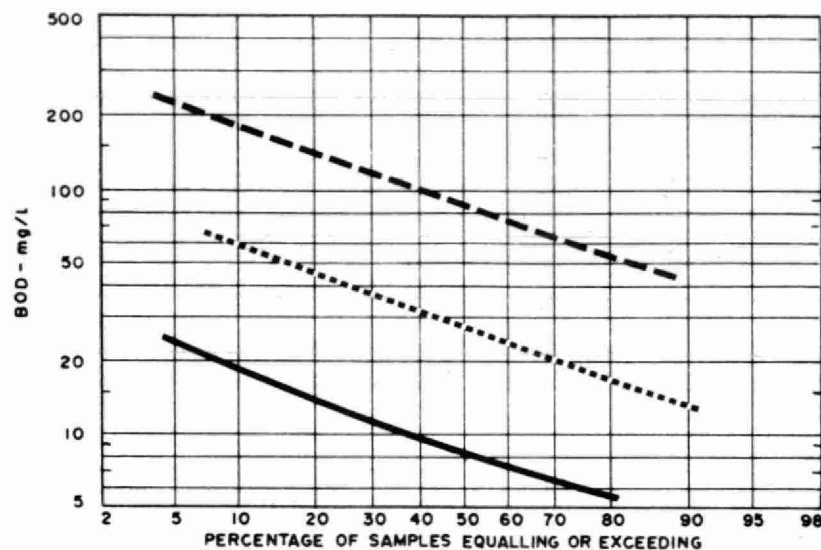


DESIGN CAPACITY — — — — —

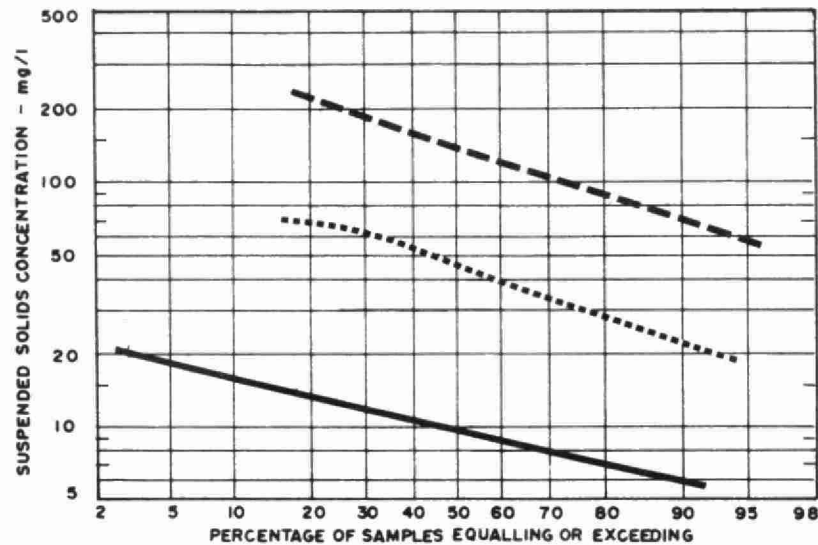
PLANT PERFORMANCE

MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	MAXIMUM RATE	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION
	million gallons	mil gal	mil gal	mgd	mg/l	mg/l	%	10 ³ pounds	mg/l	mg/l	%	10 ³ pounds	mg/l as P	mg/l as P	%
JAN	88.4	2.85	4.9	8.0	100	7	93	82	159	6	96	135	15	5	67
FEB	101.4	3.62	9.5	17.0	127	7	95	122	141	7	95	136	6	5	17
MAR	159.9	5.16	13.1	17.0	54	5	91	78	135	5	96	208	5	4	20
APR	164.2	5.49	13.4	17.0	92	8	91	138	165	8	95	258	6	3	50
MAY	89.7	2.89	4.2	7.3	107	14	87	82	160	12	93	130	7	7	0
JUNE	83.9	2.80	4.7	17.0	93	18	81	63	135	17	87	99	8	5	37
JULY	79.5	2.56	5.1	11.0	107	12	89	76	300	10	97	230	10	5	50
AUG	72.3	2.33	4.6	17.0	102	9	91	67	157	8	95	108	8	5	37
SEPT	67.8	2.26	4.0	15.0	97	12	88	58	140	10	93	88	7	6	14
OCT	73.2	2.36	3.2	7.0	87	6	93	59	150	10	93	102	7	6	14
NOV	86.8	2.89	3.7	8.0	118	8	93	95	213	8	96	178	9	6	33
DEC	117.9	3.80	9.5	17.0	32	3	91	34	70	5	93	77	6	5	17
TOTAL	1185.0	-	-	-	-	-	-	954	-	-	-	1749	-	-	-
AVG.	-	3.25	MAXIMUM 13.4	MAXIMUM 17.0	97	9	91	79	168	9	95	146	8	5	37
No. of Samples	-	-	-	-	63	63	-	-	63	63	-	-	55	55	-

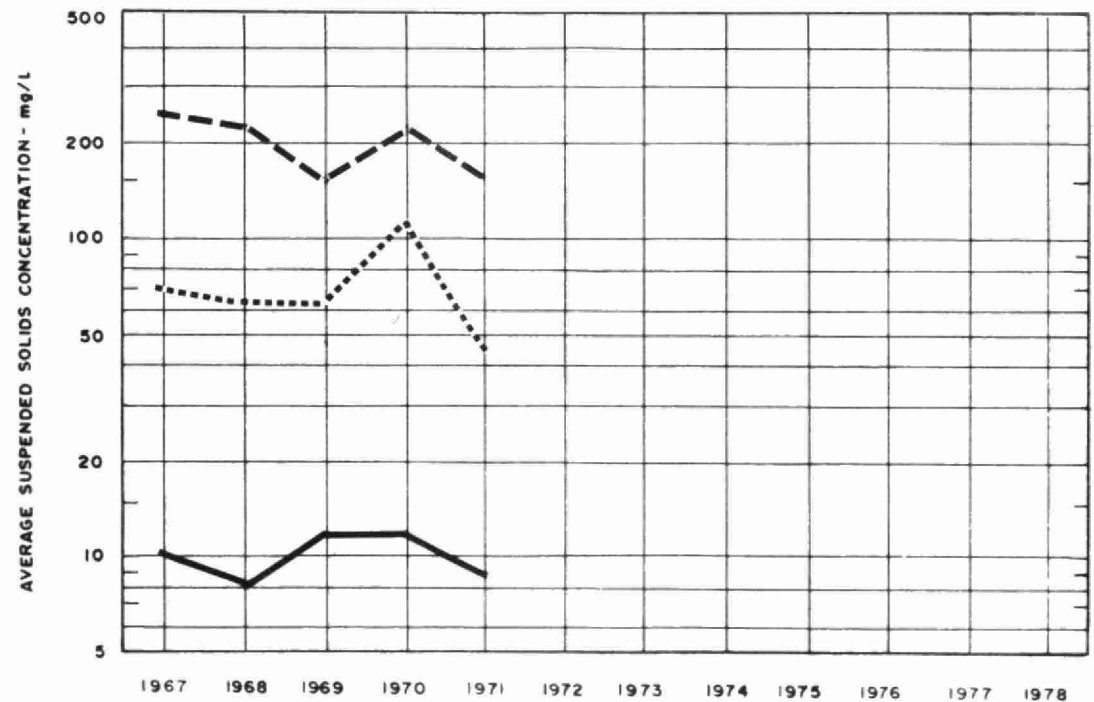
BIOCHEMICAL OXYGEN DEMAND



SUSPENDED SOLIDS



PLANT INFLUENT - - - - -
 PRIMARY EFFLUENT
 PLANT EFFLUENT _____

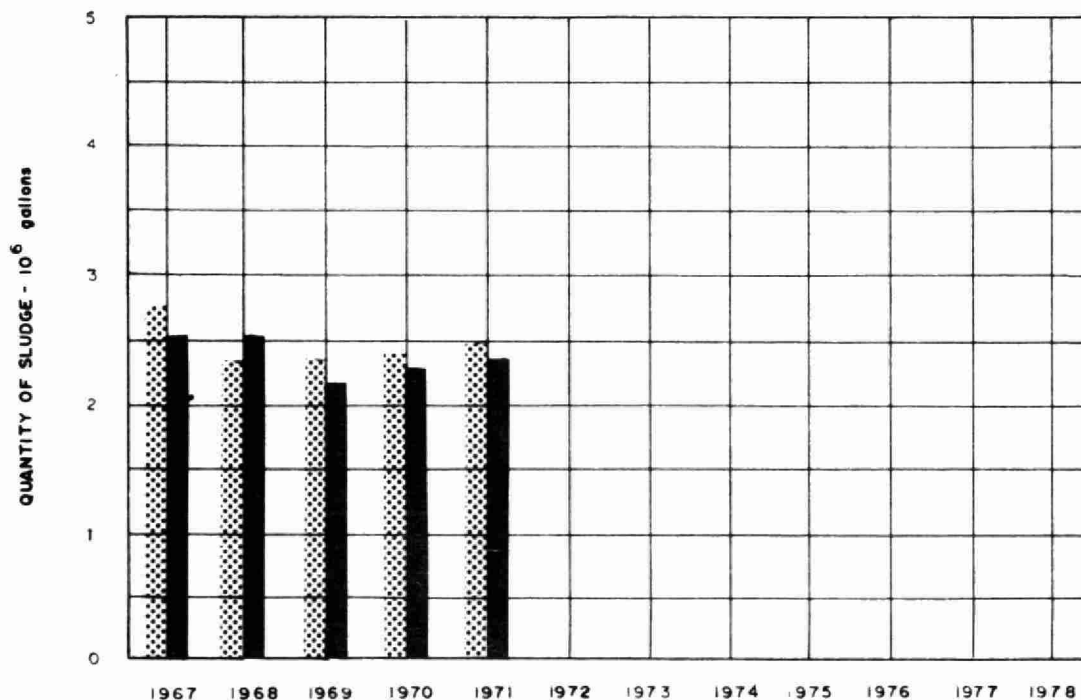
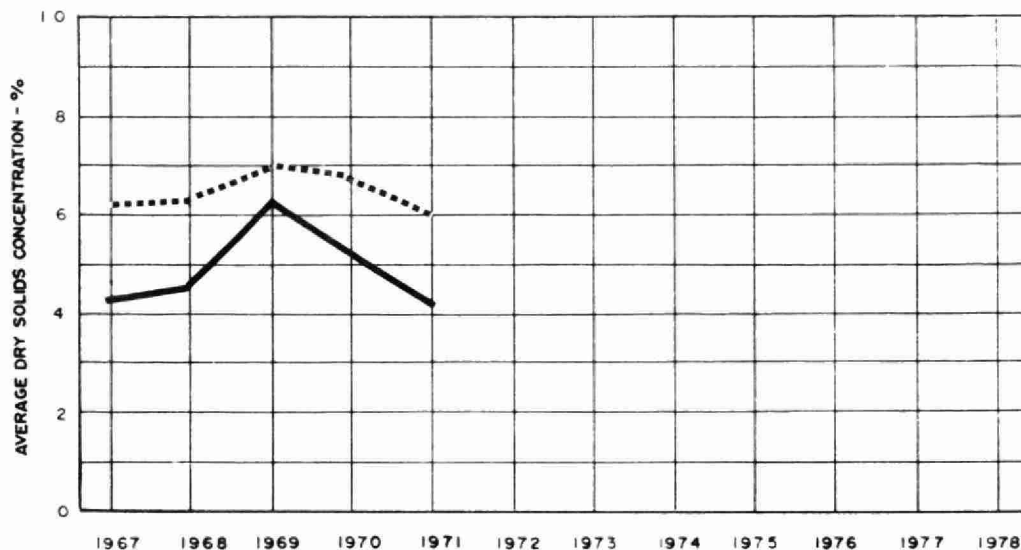


TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	CL ₂ USED 10 ³ pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day ⁻¹	AIR 1000 ft ³ lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	31	2.5	2.8	39	44	2510	.05	3.9	240	5.0	74	151	4.0	59	-	896
FEB	16	2.2	2.1	34	40	2850	.05	3.8	194	5.2	72	35	3.6	59	-	210
MAR	61	2.4	1.5	17	30	2580	.04	6.0	219	6.6	69	357	4.2	59	-	2119
APR	64	2.3	1.4	22	26	2520	.05	5.0	247	6.7	58	222	4.9	56	-	1315
MAY	11	1.9	2.2	36	38	2380	.05	6.3	239	5.6	72	200	4.2	59	-	1189
JUNE	21	2.2	2.6	38	50	2070	.05	7.0	214	5.5	63	272	4.3	64	-	1611
JULY	31	1.9	2.4	23	49	2390	.03	12.1	215	6.5	69	223	4.0	62	-	1326
AUG	32	1.6	2.2	51	58	2480	.01	3.1	228	6.1	65	264	3.7	60	-	1566
SEPT	31	1.5	2.3	36	40	2290	.04	5.5	212	6.7	64	220	3.8	57	-	1304
OCT	18	1.4	2.0	40	50	2470	.04	4.0	188	6.3	65	188	3.9	56	-	1113
NOV	17	1.6	1.8	49	60	2510	.05	3.0	179	5.9	75	97	4.2	59	-	576
DEC	42	2.3	1.9	24	50	2560	.04	4.0	198	6.1	65	190	4.1	57	-	1128
TOTAL	375	23.8	-	-	-	-	-	-	2573	-	-	2419	-	-	-	14353
AVG.	.3 cu. ft/mil gal	2.0	2.0	32	42	2470	.05	5.3	214	6.0	68	202	4.1	59	-	1196

DIGESTION

RAW SLUDGE
DIGESTED SLUDGE —————



RAW SLUDGE TO DIGESTER
DIGESTED SLUDGE REMOVED —————

LABORATORY LIBRARY



96936000119533

Date Loaned

LABORATORY LIBRARY
MINISTRY OF THE ENVIRONMENT